**Research Article**

# Evaluation of Hepatitis A Seroprevalence in Kastamonu Province, Turkey

## Kastamonu İlinde Hepatit A Seroprevalansının Değerlendirilmesi

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**Abstract**

**Aim:** Hepatitis A disease is a contagious liver infection caused by the hepatitis A virus (HAV). This study aimed to decide the hepatitis A seroprevalence in all age groups in Kastamonu province, Turkey.

**Material and Method:** The current study analyzed the anti-HAV antibodies test results of the patients who applied to Kastamonu Training and Research Hospital for various reasons between 2018-2022. The most up-to-date test results of patients sent more than one serum sample were evaluated. The patients were separated into eight age groups: 0-10,11-20, 21-30, 31-40, 41-50, 51-60, 61-70, and ≥71. The anti-HAV IgM and anti-HAV IgG values were determined using the chemiluminescence microparticle immunoassay method in the Abbott Architect i2000SR. The results were evaluated based on the manufacturer's instructions.

**Results:** There was positivity in 27 (1.3%) of 2083 patients in whom anti-HAV IgM was studied and in 837 (58.2%) of 1439 patients in whom anti-HAV IgG was studied. The anti-HAV IgG positivity in females and males was 55.9% and 61.0%, respectively; anti-HAV IgM positivity was 1.7% and 0.8%. The anti-HAV IgG positivity rate increased with increasing age (p<0.001). The age group with the highest rate of anti-HAV IgG positivity (100%) was ≥61, and the age groups with the lowest rate of anti-HAV IgG positivity (26.0% and 33.7%) were determined as 11-20 and 21-30. Also, the anti-HAV IgG positivity in the 0-10 age group was 70.1%.

**Conclusion:** These data showed that hepatitis A seronegativity was high in the 11-20 and 21-30 age groups in Kastamonu province. Since the prognosis of hepatitis A disease may worsen with increasing age, the HAV vaccine is suggested for the seronegative young population.

**Keywords:** Age groups, anti-HAV, Hepatitis A, IgG, IgM

**Öz**

**Amaç:** Hepatit A hastalığı, hepatit A virüsünün (HAV) neden olduğu bulaşıcı bir karaciğer enfeksiyonudur. Bu çalışmada Kastamonu ilindeki tüm yaş gruplarında Hepatit A seroprevalansının belirlenmesi amaçlanmıştır.

**Materyal ve Metot:** Çalışmada 2018-2022 yılları arasında Kastamonu Eğitim ve Araştırma Hastanesi'ne çeşitli nedenlerle başvuran hastaların anti-HAV antikor test sonuçları retrospektif olarak değerlendirilmiştir. Birden fazla serum örneği gönderilen hastaların en güncel test sonuçları değerlendirmeye alınmıştır. Hastalar 0-10, 11-20, 21-30, 31-40, 41-50, 51-60, 61-70 ve ≥71 olmak üzere sekiz yaş grubuna ayrılmıştır. Anti-HAV IgG ve anti-HAV IgM değerleri Abbott Architect i2000SR cihazında kemiluminesans mikropartikül immün assay yöntemi ile çalışılmış ve sonuçlar üretici firmanın önerileri doğrultusunda değerlendirilmiştir.

**Bulgular:** Anti-HAV IgM çalışılan 2083 hastanın 27 (%1,3)'sinde, anti-HAV IgG çalışılan 1439 hastanın 837 (%58,2)'sinde pozitiflik belirlenmiştir. Kadınlar ve erkeklerdeki anti-HAV IgG pozitifliği sırasıyla %55,9 ve %61,0; anti-HAV IgM pozitifliği ise %1,7 ve %0,8 olarak bulunmuştur. Artan yaş ile birlikte anti-HAV IgG pozitiflik oranının yükseldiği tespit edilmiştir (p<0,001). Anti-HAV IgG pozitiflik oranının en yüksek (%100) olduğu yaş grubu ≥61 yaş, en düşük (%26,0 ve %33,7) olduğu yaş grupları 11-20 ve 21-30 olarak saptanmıştır. İlave olarak 0-10 yaş grubunda Anti-HAV IgG pozitiflik oranı %70,1 olarak tespit edilmiştir.

**Sonuç:** Sonuç olarak 11-20 ve 21-30 yaş gruplarında hepatit A seronegatifliği yüksek oranlarda bulunmuştur. Sonuçlar, hepatit A hastalığının prognozunun artan yaş ile birlikte olumsuz seyretme riskinin yüksek olmasından dolayı, HAV aşısının genç erişkin bireylere de uygulanması gerektiğini göstermektedir.

**Anahtar Kelimeler:** Anti-HAV, Hepatit A, IgG, IgM, yaş grupları

## INTRODUCTION

Hepatitis A disease is a contagious liver infection caused by the hepatitis A virus (HAV). The infection is present worldwide. However, the virus has the potential to cause epidemics in areas with poor sanitation and unvaccinated populations (1). HAV is usually transmitted from person to person through the consumption of contaminated food and drink. Also, it can be transmitted through a blood transfusion during viremia (2).

Although the hepatitis A infection does not show a chronic course, its symptoms can range from mild to severe. However, it is known that individuals who are unvaccinated and encounter the virus for the first time in adulthood are at risk (3). Moreover, age is considered to be the most significant factor determining prognosis, as the disease advances more severely and the mortality rate is high in advanced age groups (4).

HAV-specific immunoglobulin M (IgM) and immunoglobulin G (IgG) antibodies are examined in the patient's serum sample in the hepatitis A diagnosis. The serological profile is interpreted as i) only anti-HAV IgM positivity indicates the early stage of acquired infection, ii) both anti-HAV IgG and anti-HAV IgM positivities indicate late stages of infection, and iii) only anti-HAV IgG positivity indicates acquired immunity (5). Since there is only one serotype of HAV, anti-HAV IgG formed in individuals is permanent for life and is widely used in hepatitis A seroprevalence studies (6).

Knowing the hepatitis A seroprevalence of a population in a region or province can be a guide for taking appropriate preventive measures and establishing vaccination programs against the infection (7,8). It is stated that Turkey has a moderate endemicity level of hepatitis A when compared to the rest of the world (9,10). In addition, hepatitis A seroprevalence in Turkey may vary based on geographical regions and provinces. In the literature, there is no data on hepatitis A seroprevalence in Kastamonu province in the north of Turkey. Therefore, this study aimed to determine the hepatitis A seroprevalence in all age groups in Kastamonu province. The second aim of the study is to compare the data obtained from this study with the results in different regions of Turkey.

## MATERIAL AND METHOD

Ethical approval for this study was obtained from the Kastamonu University, Faculty of Medicine Non-Interventional Clinical Research Ethics Committee (Date: 11.05.2022, Decision no: 2022-KAEK-45).

Anti-HAV antibodies test results of the patients who applied to Kastamonu Training and Research Hospital (TRH) for various reasons between January 2018 and January 2022 were analyzed retrospectively using the laboratory database in the current study. The most up-to-date test results of patients sent more than one serum sample were evaluated. The patients were separated into eight age groups: 0-10, 11-20, 21-30, 31-40, 41-50, 51-60, 61-70, and ≥71. The anti-HAV IgM and anti-HAV IgG values were determined using the chemiluminescence microparticle immunoassay (CMIA) method in the Abbott Architect i2000SR (Abbott Laboratories, Chicago, IL, USA). The results were evaluated based on the manufacturer's instructions, and <1 S/CO and ≥1 S/CO were considered to be negative and positive values, respectively.

### Statistical Analysis

The statistical analyses were done using the Pearson chi-square test in SPSS 23.0 for Windows (IBM Inc., Armonk, NY, USA). The statistical significance was accepted as $p<0.05$.

## RESULTS

The anti-HAV IgM and anti-HAV IgG tests were studied in 2083 and 1439 patients, respectively, in this study. The anti-HAV IgM and anti-HAV IgG positivity were detected to be 1.3% and 58.2%, respectively (Table 1). The anti-HAV IgG positivity in females and males was 55.9% and 61.0%, respectively; anti-HAV IgM positivity was 1.7% and 0.8%. No statistically significant difference (p>0.05) was found for hepatitis A seroprevalence between the genders (Table 2).

**Table 1. Seroprevalence of anti-HAV IgG and anti-HAV IgM in the study groups**

|  | Positive [n (%)] | Negative [n (%)] | Total |
|---|---|---|---|
| **Anti-HAV IgM** | 27 (1.3%) | 2056 (98.7%) | 2083 |
| **Anti-HAV IgG** | 837 (58.2%) | 602 (41.8%) | 1439 |

HAV: Hepatitis A virus, IgG: Immunoglobulin G, IgM: Immunoglobulin M, n: Number

**Table 2. Comparison of anti-HAV IgG and anti-HAV IgM seropositivity based on gender**

|  |  | Female [n (%)] | Male [n (%)] | p value |
|---|---|---|---|---|
| **Anti-HAV IgM** | Positive | 19 (1.7%) | 8 (0.8%) |  |
|  | Negative | 1082 (98.3%) | 974 (99.2%) | 0.067 |
|  | Total | 1101 | 982 |  |
| **Anti-HAV IgG** | Positive | 449 (55.9%) | 388 (61.0%) |  |
|  | Negative | 354 (44.1%) | 248 (39.0%) | 0.052 |
|  | Total | 803 | 636 |  |

HAV: Hepatitis A virus, IgG: Immunoglobulin G, IgM: Immunoglobulin M, n: Number

While the mean age of the patients in the anti-HAV IgM study group was 33.0±19.5, the mean age of the patients in the anti-HAV IgG study group was 32.5±19.2. The anti-HAV IgG positivity increased with the age group (p<0.001). The age groups with the lowest anti-HAV IgG positivity were 11-20 (26.0%) and 21-30 (33.7%). The anti-HAV IgG positivity rates were over %92 over 41 years of age. The anti-HAV IgG positivity rate was 70.1% in the 0-10 age group. The highest anti-HAV IgM positivity rate was in the 61-70 age group at 2.5% and the lowest in the 0-10, 11-20, and 21-30 age groups at 0.7%. There was no significant difference (p=0.24) between the age groups and the anti-HAV IgM positivity rate (Table 3).

**Table 3. The distribution of anti-HAV IgG and anti-HAV IgM positivity based on age groups**

| Age Group | Anti-HAV IgM* | | Anti-HAV IgG** | |
|---|---|---|---|---|
| | Positive [n (%)] | Total (n) | Positive [n (%)] | Total (n) |
| 0-10 years | 1 (0.7%) | 148 | 78 (70.1%) | 110 |
| 11-20 years | 3 (0.7%) | 413 | 95 (26.0%) | 365 |
| 21-30 years | 4 (0.7%) | 603 | 119 (33.7%) | 353 |
| 31-40 years | 7 (2.3%) | 304 | 130 (71.0%) | 183 |
| 41-50 years | 4 (2.1%) | 190 | 132 (92.3%) | 143 |
| 51-60 years | 3 (1.9%) | 159 | 122 (98.4%) | 124 |
| 61-70 years | 4 (2.5%) | 158 | 96 (100%) | 96 |
| ≥71 years | 1 (0.9%) | 108 | 65 (100%) | 65 |
| **Total** | 27 (1.3%) | 2083 | 837 (58.2%) | 1439 |

HAV: Hepatitis A virus, IgG: Immunoglobulin G, IgM: Immunoglobulin M, n: Number *p=0.24, **p<0.001

**Table 4. Hepatitis A seroprevalence in various provinces/cities of Turkey in the last decade (2012-2022).**

| Study | Period | Province/City | Age | Anti-HAV IgM positivity (%) | Anti-HAV IgG positivity (%) |
|---|---|---|---|---|---|
| Çitil et al. (13) | 2012-2013 | Adıyaman | 0-≥81 | NA | 77.5 |
| Ertürk et al. (14) | 2012-2013 | Rize | 17-70 | 1.2 | 75.0 |
| Aşçı et al. (15) | 2013-2014 | Afyon | 0-≥40 | NA | 69.7 |
| Köroğlu et al. (16) | 2012-2014 | Sakarya | 0-92 | 4.4 | 74.7 |
| Bölükbaş et al. (17) | 2013 | Bolu | 0-≥70 | NA | 76.2 |
| Çalık et al. (18) | 2015-2016 | İzmir | 0-≥55 | NA | 74.0 |
| Yilmaz (19) | 2015-2018 | Erzurum | 0-93 | 0.2 | 87.3 |
| Tuna et al. (9) | 2016-2018 | Van | 0-≥50 | NA | 48.7 |
| İnci et al. (20) | 2016-2019 | Karabük | 0-≥60 | 0.1 | 57.0 |
| Çavuş et al. (21) | 2017 | Bingöl | 16-≥70 | NA | 97.4 |
| Kader et al. (22) | 2017 | Yozgat | 6->60 | NA | 79.1 |
| Alkan Çeviker et al. (23) | 2017-2018 | Samsun | 0-≥81 | NA | 58.9 |
| Kula Atik et al. (24) | 2017-2019 | Balıkesir | 0-≥51 | 2.6 | 68.6 |
| Düzenli et al. (10) | 2017-2020 | Çorum | 0->80 | 0.7 | 84.4 |
| This study | 2018-2022 | Kastamonu | 0-≥71 | 1.3 | 58.2 |

HAV: Hepatitis A virus, IgG: Immunoglobulin G, IgM: Immunoglobulin M, NA: Not available

## DISCUSSION

The World Health Organization estimates that nearly 1.5 million cases of hepatitis A infection occur worldwide every year (11). Although hepatitis A is a vaccine-preventable disease, it remains significant in developing countries. Based on hepatitis A incidence in the world, three different endemicity patterns have been identified high, moderate, and low endemicity (12). Turkey is at a moderate endemicity level of hepatitis A seroprevalence compared to the world, but the rates may differ between geographical regions and provinces.

The existence of anti-HAV IgG in the patient serum is an indicator of acquired immunity. Moreover, since HAV has the only serotype, the immunity is permanent for many years (5,6). Hepatitis A seroprevalence studies conducted in Turkey in the last decade are summarized in Table 4. Briefly, anti-HAV IgG positivity was reported in 48.7-97.4%

(9,10,13-24). The current study determined the anti-HAV IgG positivity to be 58.2%. The findings showed that the anti-HAV IgG positivity of Kastamonu province was within the range of the results of other studies conducted in Turkey. However, this rate in Kastamonu was generally low compared to many provinces (except Van and Karabük provinces). On the other hand, the anti-HAV IgG positivity was determined to increase with age groups in this study, which was consistent with the literature. This may be because individuals have more contact with the external environment with increasing age and the possibility of consuming contaminated food and beverages increases. However, the anti-HAV IgG positivity was determined to be higher in the 0-10 age group (70.1%) than in the 11-20 (26.0%) and 21-30 (33.7%) age groups. The hepatitis A vaccine had on the national vaccination calendar in September 2012 in Turkey and started to be administered to children born after March 2011 in two doses at the

18th and 24th months (25). Therefore, the anti-HAV IgG positivity may have been higher in the 0-10 age group than in the 11-20 and 21-30 age groups in this study. The results showed that especially the 11-30 age group in Kastamonu has a high risk of acquiring hepatitis A.

The detection of only anti-HAV IgM in the serum sample indicates acute hepatitis A disease (5,6). The anti-HAV IgM positivity has been reported in the range of 0.1%-4.4% in studies conducted in Turkey in the last decade (10,14,16,19,20,24). The anti-HAV IgM positivity was detected at a rate of 1.3% in 2083 different patients who applied to Kastamonu TRH between 2018-2022 in the present study. The results showed that Kastamonu province is within Turkey's mean in terms of acute hepatitis A.

It was observed that different results were obtained in studies in which gender and anti-HAV IgG positivity were evaluated together in the literature. While no significant difference was found between hepatitis A seroprevalence and gender in many studies (10,13,21,22,24), the anti-HAV IgG positivity was determined to be significantly greater in females or males compared to the opposite gender in some studies. For instance, Yılmaz (19) reported that anti-HAV IgG positivity was statistically higher in males than in females and attributed this to males having more contact with the external environment. However, Tuna et al. and Alkan Çeviker et al. found that anti-HAV IgG positivity in females was significantly higher than in males (9,23). Anti-HAV IgG positivity was higher in males (61.0%) than in females (55.9%), and anti-HAV IgM positivity was higher in females (1.7%) than in males (0.8%) in the present study. However, these differences were not statistically significant (p>0.05).

## CONCLUSION

Kastamonu TRH is the central hospital in the province. So, the results provide data about the hepatitis A seroprevalences of Kastamonu province. As a result, hepatitis A seronegativity was high in the 11-20 and 21-30 age groups. The results suggest that these age groups may be the risk group for hepatitis A in Kastamonu. Since the prognosis of hepatitis A disease may worsen with increasing age, the HAV vaccine is suggested for the seronegative young population.

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